

	SCOPE OF WORK	Grootvlei
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	Grootvlei Power Station		Engineer's Responsibility
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1. Introduction

This document defines detailed scope of work for correlation and parallel testing of the Continuous Emission Monitors on the North Stack as per Eskom Emissions Monitoring and Reporting Standard (240-56242363).

2. Supporting Clauses

2.1 Scope

This specification covers requirements for correlation and parallel testing of the Continuous Emission Monitors to ensure compliance with Atmospheric Emission Licence (Dipaleseng/Eskom H SOC Ltd/GPS/0015/2024/F04).

2.1.1 Purpose

The purpose of this document is to:

- Ensure that correlation and parallel test is done according to the standards requirements.
- Detail each step in correlation and parallel testing

2.1.2 Applicability

This document shall apply throughout Grootvei Power Station.

2.2 Normative/Informative References

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

- [1] ISO 9001 Quality Management Systems.
- [2] VDI 2066 – Particulate Matter Measurement.
- [3] VDI 3950 – Calibration of Automatic Emission Measuring Instruments.
- [4] ISO 9096 – Stationary Source Emissions – Manual Determination of Mass Concentration of Particulate Matter.
- [5] ISO 10155 – Stationary Source Emissions – Automated monitoring of mass concentrations of particles: Performance characteristics, test methods and specifications.
- [6] ISO 12141 – Determination of mass concentration of particulate matter (dust) at low concentrations. Manual gravimetric method.
- [7] EN 13284-1 Determination of low range mass concentration.
- [8] BS EN 15259 -Requirements for Measurement Sections.
- [9] BS EN 14181 – Quality Assurance of automated Measuring Systems.

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[10] US EPA Method 5 – Determination of Particulate Matter Emissions from Stationary Sources (External stack sampling)

2.2.2 Informative

[11] National Environment Management: Air Quality Act, 2004 (Act No. 39 of 2004).

[12] Atmospheric Emission License – Dipaleseng/Eskom/ H SOC Ltd/GPS/0015/2024/F04.

2.3 Definitions

Definition	Explanation
CEM	Continuous Emissions Monitors refers to all equipment used in the measurement of flue gas constituent and parameters including particulate monitors, gaseous monitors and flue gas process monitors such as oxygen, velocity, temperature, pressure etc.
Correlated Signals/readings	Signals or readings that have been corrected with SANAS Periodic test.
Dust correlation	Process to correlate mass emissions with the output of the dust monitor.
Gaseous verification / Parallel test	Process to verify online emission with a certified parallel test monitor to produce a correction factor.
Spot Check	Shorter version of the full correlation or parallel tests and is used to verify the monitor and/or the validity of the correlation and parallel tests. These tests comprise of either 3 or 5 measurement points depending on the standard being used.
Abatement Plant Control Efficiency	Efficiency of abatement control plant is expressed as a percentage of pollutant emitted to that of the amount of pollutant entering abatement control plant. Amount of pollutant can be expressed as concentration of absolute mass.
Quality Assurance Level 2 (QAL2)	This is stage of quality assurance specifies procedures to ensure that the continuous emissions monitoring system has been correctly installed, calibrated by comparing of measurements and are independently verified.

2.4 Abbreviations

Abbreviation	Explanation
AEL	Atmospheric Emissions Licence
AMS	Automatic Measurement System (AMS=CEMS)
CEMS	Continuous Emissions Monitoring System (CEMS=AMS)
EN	European National Standard
ISO	International Standards Organisation
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEMAQA	National Environmental Management: Air Quality Act (Act No. 39 of 2004)
QAL	Quality Assurance Level
SRM	Standard Reference Method
VDI	Verein Deutscher Ingenieure

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2.5 Roles and Responsibilities

- Boiler Engineering is responsible for verifying data, identifying plant deviations, and providing boiler process data. They also conduct an overall review of the draft report to ensure it complies with the specified standard.
- Contractor to ensure that they comply with Eskom Environmental, health, and safety requirements, policies and procedures.
- Ensure that report is submitted within 2 weeks after the test, report should also include SANAS accreditation certificate that is approve for that test reference method.

2.6 Process for Monitoring

N/A

2.7 Related/Supporting Documents

None

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3. Scope of Work – Correlation and Parallel testing

3.1 Correlations of Dust Monitors – Scope of Work

Correlation of Dust monitors means where output of monitors is correlated against mass emissions. It referred to as dynamic calibration or calibration. The use of name correlation is to distinguish it from monitor calibration, where electronic circuitry is calibrated against known values. Monitor correlation compares iso-kinetically measured emissions over a period with the monitor output over the same period.

3.1.1 Procedure

Eskom adopted VDI 2066 procedure however the use of procedure described by EN 13284-1, ISO 9096 and/or ISO 12141 standards are acceptable provided they meet the requirements below. ISO 10155 may be considered to develop regression curves.

In addition to the above requirements, the following are some of the more important prerequisites:

- For a full dust correlation minimum of 9 successful tests, with an additional of 3 to make provision for failed tests or outliers. These tests should be done using quarts fibre filters.
- Percentage of iso-kineticity shall be between 95 and 105 % for test to be successful. Test to be repeated if this is not achieved.
- Filter samples will be sent to accredited laboratory for a particle size distribution, 2 samples be sent to Eskom RT&D for comparison of the PSD results.
- The sample should be taken carefully to ensure that it is the true representation of the flue gas, i.e. Isokinetic measurements should be in accordance with MES/Eskom approved equivalent (ISO, EN or VDI)
- EN13284-1 and ISO 12141 is preferred for particulate concentrations below 75 mg/Nm³ as it is more sensitive at low concentrations when compared to ISO 9096 and VDI 2066.
- Smaller flat plate quartz fibre filters are recommended for low level particulate determination.
- Velocity into sample head should be within +/- 10% of the velocity approach.
- Ensure correct orientation of nozzle into the flow to prevent bias to over or under sampling of large particles (>5 µm) since they have significant momentum and to ensure collector nozzle faces directly into the flue gas stream throughout sampling.
- All measurements should be corrected to Standard temperature (0°C) and pressure (101.325 kPa) to normal cubic meters (dry basis) corrected to 10% oxygen (Nm³ (d) @ 10% O₂).
- Sampling time depends on uncertainty of mass measurement of the test laboratory, it should be rounded up to the nearest hour per test.
- This test should be done as normal operating conditions, no leaking bags since they change correlation relationship. FFP visual inspection should be conducted prior before set up to ensure no bags are leaking.
- Three zero points on top of test points should be included in the correlation as per criteria in VDI 2066.
- If the intercept is greater than 10% of the Limit value, add another 3 zero points.

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- Is it still greater than 10% of the Limit value with 6 zero points, correlation is invalid and will need to be repeated.
- Correlation coefficient (R) should be greater than 90% for correlation to be successful.
- Efficiency testing of the particulates Abatement Control Plant should be done as part of extended full correlation test scope after General Overall (GO) outage.

3.1.2 Frequency

- As per the MES requirements, dust monitor shall be correlated once every 2 years. It is recommended that correlation be once every 21-23 months.
- Spot check may be done on the dust monitor to verify readings and curve as and when required.
- After full bag replacement, full correlation should be after 3 000 operating hours that is settling time of bags and ensure that their representative of normal operating conditions.

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3.2 Parallel test of Gas monitors – Scope of Work

Parallel test is a process of verifying online emission with a certified parallel test monitor to produce a correlation factor.

3.2.1 Procedure

Eskom adopted EN 14181 procedure for parallel testing of gaseous monitors. It procedure a calibration function from the results of several parallel measurements performed with Standard Reference Method (SRM).

In addition to the above requirements, the following are some of the more important prerequisites:

- Minimum of 15 valid parallel measurements shall be done with plant on normal operating conditions. These tests shall spread over at least 3 days and over each of the measuring days of normally 8 to 10 h (e.g. not 5 measurements in the morning and none in the afternoon) and be performed within a period of four weeks.
- Set of measurements is valid when SRM measurements are done according to accepted standard and time period of each AMS measured signal is larger than 90% of the averaging time.
- AMS and SRM measurements each is considered as a measurement pair, and these shall cover the same time.
- Sampling time for each measurement pair shall be at least 30 minutes, or at least 4 times the response time of the AMS, including sampling system or whichever is greater.
- Results from SRM shall be expressed under the same conditions as those measured by AMS, to get calibration function and do variability test. Additional parameters and values included in corrections to AMS and Standard conditions shall be obtained for each measurement pair.

3.2.2 Frequency

- As per the MES requirements, gas monitor shall be verified/parallel tested once every 2 years. It is recommended that correlation be once every 21-23 months.
- Major change in plant operation.
- Failure of the AMS.
- Spot check may be done on the gas monitor to verify readings and curve as and when required.

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4. Acceptance

This document has been seen and accepted by:

Note: Initials not acceptable

	Designation
	Acting Boiler Engineering Manager
	Engineering Manager

5. Revisions

Date	Rev.	Remarks
February 2026	1	Compiled for Correlation and Parallel contract.

6. Development Team

The following people were involved in the development of this document:

7. Acknowledgements

None

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